Multi-Band, Multi-Standard, Multi-Carriers (mBSC) Coverage System User Manual



BRAVO TECH INC
Add.: 6185 Phyllis Drive Unit D, Cypress, CA 90630
Phone: 1-714-230-8333
Website: www.bravotechinc.com

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The “**MBSC Coverage System**” must be installed only in a restricted access area.

The “**MBSC Coverage System**” is designed to operate according to the specification of this User Manual.

Improper installation and operation of this equipment beyond the installation procedures, beyond the designed operating specifications, and not in compliance with regulatory requirements will revoke any warranty and may:

Prevent the equipment from performing properly

Violate regulatory RF emissions requirements

Require removal of the equipment from service.

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1 Introduction

The Multi-band, Multi-Standard, Multi-Carrier(mBSC) High Power Coverage System is a feed-forward, in-line power amplifier operates in various mobile bands for indoor coverage and/or tunnel coverage. mBSC system provides complete “once-for-all” coverage solution for cellular communication system in any environment with multiple frequency bands, air interface independent, and multiple carriers.

1.1 mBSC Components

The In-line mBSC is a multi-carrier linear power amplifier which includes MCPAs(Multi-carrier Power Amplifier), LNAs(Low Noise Amplifier), Duplexers, Control Unit, Power Supply Unit and Cooling Fans.



Figure 1 mBSC Unit

1.2 mBSC Connection

mBSC connects with BTS/POI (Point of Interface) and antenna, shown as below.

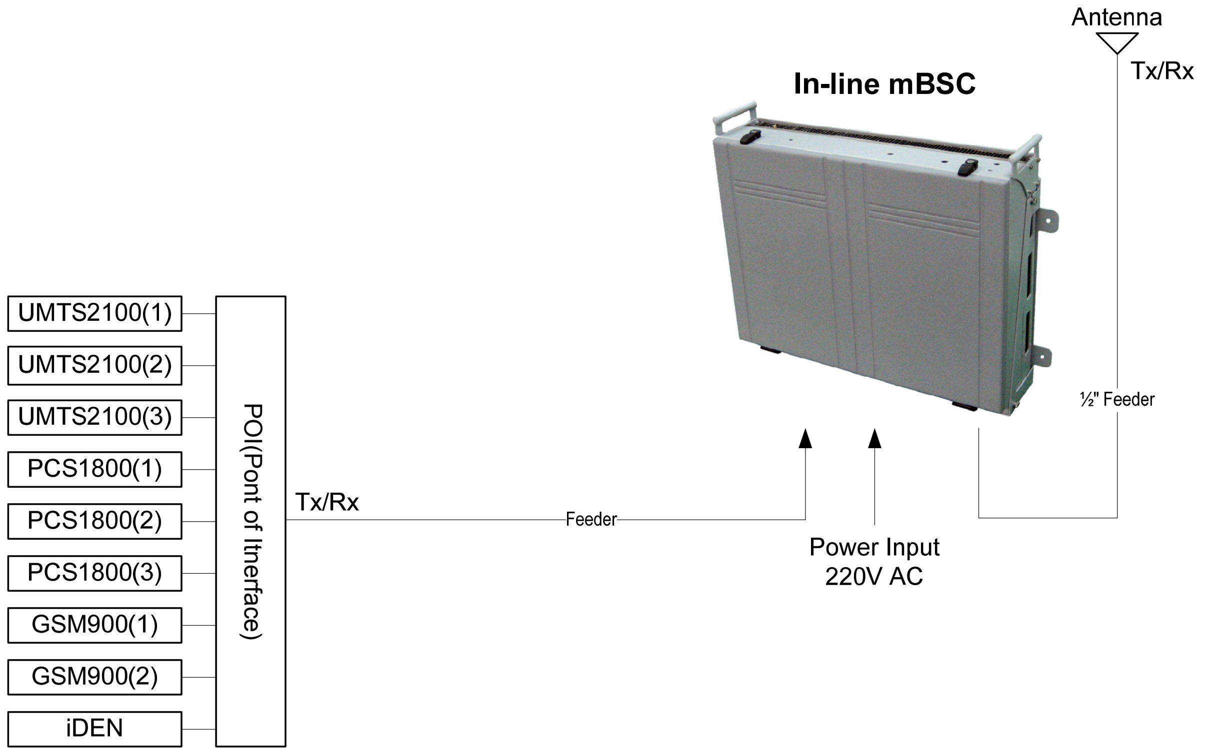


Figure 2 In-line mBSC System Connection

POI interfaces with signal side close to BTS, either direct connects to multiple BTS, repeaters. For downlink POI combines the signal up from multiple bands and feed to mBSC system. For uplink POI splits signal into multiple bands received from mBSC system.

The mBSC system provides downlink signal booster and uplink sensitivity improvement for multiple bands signal, which may be in multiple standards and multiple carriers. The ports of mBSC are shown below.

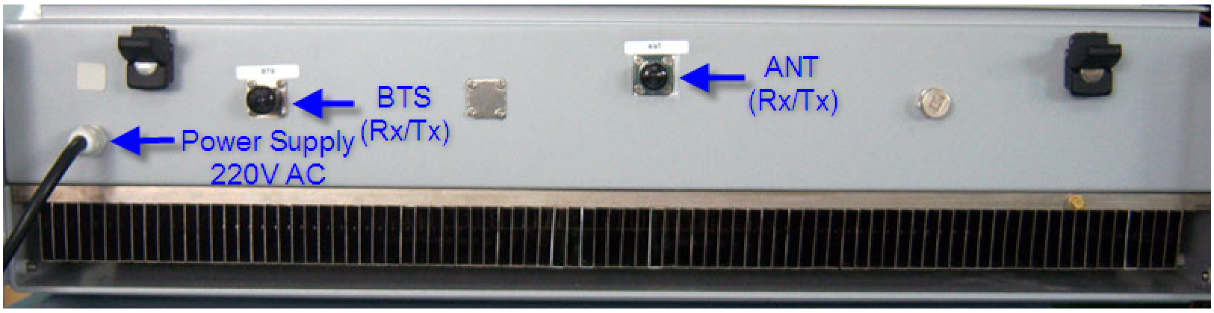


Figure 3 mBSC Ports

1.3 mBSC Block Diagram

The mBSC Coverage System amplifies the downlink signals as well as increases the uplink signals sensitivity.

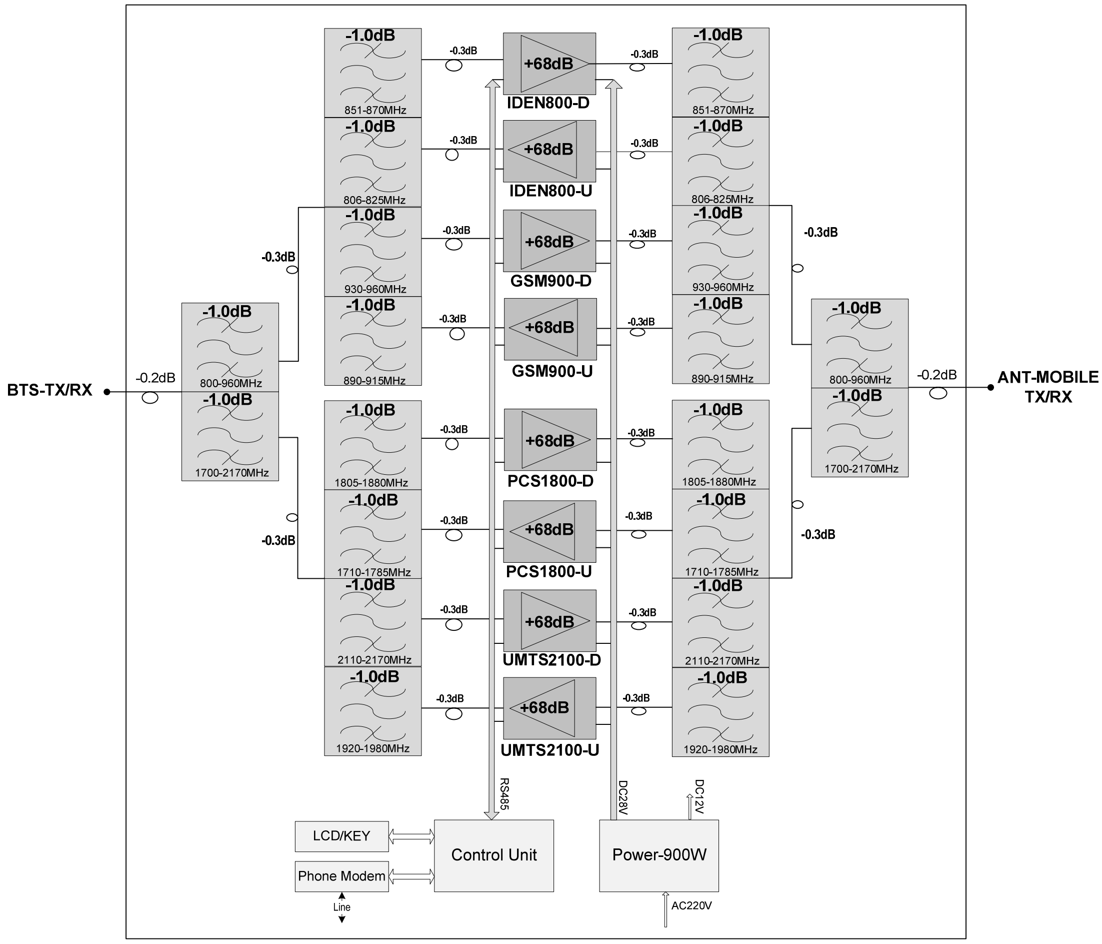


Figure 4 mBSC Schematic

1.4 Outline Drawing

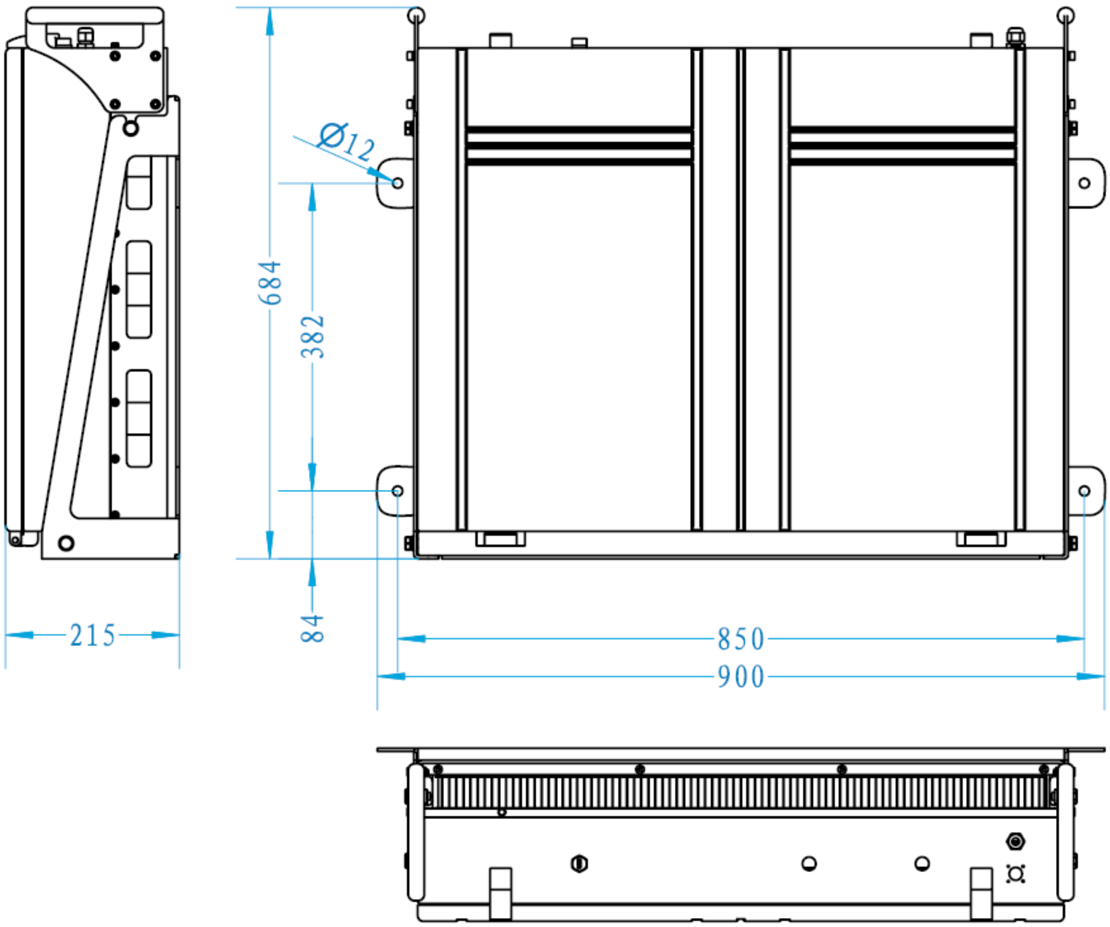


Figure 5 mBSC Outline Drawing

2 System Installation

2.1 Installation Flow

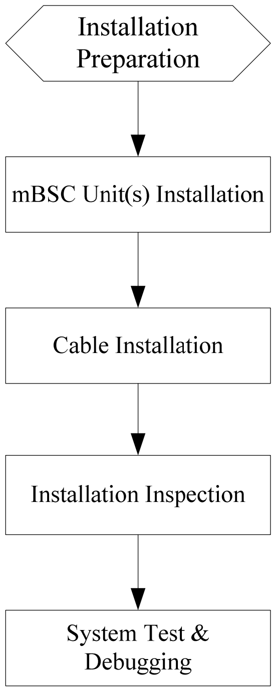


Figure 6 Installation Flow

2.2 Installation Site

The mBSC unit is installed on the wall.

The wall should be water-resistant, dry, non-caustic and without high-voltage power leaking.

The wall's bearing capacity is more than 136kg.

Concrete walls and brick walls are recommended, because those walls can fix expanded screws. Masonry walls or sandy-dust walls are not suitable.

2.3 Anti-corrosion and Shock-protection

To safeguard products and operators, the installing location must be kept away from caustic or poisonous pollutants. If the site can't meet seismic, it must be properly reinforced.

2.4 Illumination, Ventilation and Fire Protection

The installation site should have enough illumination for installation and maintenance needs. Flammable and explosive material should not be near the site.

2.5 Power Requirements

Nominal voltage: 220V AC. Variety range: 180-264 V AC, 47-63 Hz Single Phase.

The power consumption of the mBSC Unit is about 1300W. Make sure to select a fuse or breaker with the proper capacity. A 10A or 15A breaker is recommended.

2.6 Lightning Protecting and Grounding

The cross section of grounding cable should be no smaller than 25mm^2. The grounding cable should be connected to earth ground directly without any splices. Keep the grounding cable as short as possible.

2.7 Installation Preparation

The following technical files and tools will be used for a successful installation:

- A multimeter
- Phillips screwdrivers
- Flat blade screwdrivers
- Wrenches
- A Drill
- A VSWR testing device
- N adapters
- RF testing cables
- Power meter (part of hand-held tester)

2.8 mBSC Unite Installation

2.8.1 Installation Requirements

- Unused circuit breaker
- Convenient maintenance access
- Sufficient space for installation

2.8.2 Installation

⚠ Caution:

The following high-altitude operation should be only performed by qualified personnel under well protection.

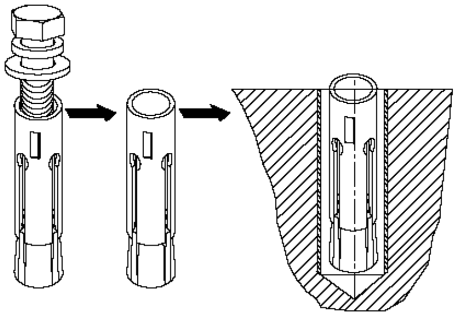


Figure 7 Installing Inflatable Bolt

Instructions:
1) Hold mount in place;
2) Make holes (Please find the distance information on Figure 5);
3) Drill;
4) Install expansion bolts (M10X70) (concrete anchors);
5) Bolt the mount into place.

2.9 Cable Installation

2.9.1 Installation Requirements

Note:

The NEC(National Electrical Code) does not allow signal wires to share the same conduit with power wires unless the signal cable's voltage range is equal to the power wire's voltage range.

- Avoid bundling signal cable and grounding cable/power cable, keep them separate.
- The power cable and grounding cable are supplied.
- Check open and short circuits before installing the power cable.

2.9.2 Installation

Attention:

All the power switches must be switched off before cable installation.

The ground terminal of the mBSC unit is at the top of the housing near to the convection port as shown in Figure 8. The grounding cable should be green or yellow-green colored copper cable, with section larger than 25mm^2 and resistance lower than 0.5Ω.

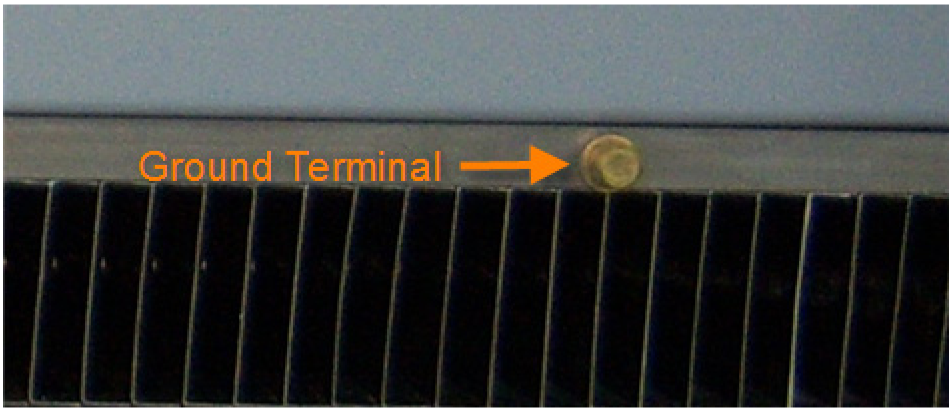


Figure 8 Installing Grounding Cable

2.10 Installation Inspection

2.10.1mBSC Unit Inspection

Item	Description
1	Stable and normal.
2	Properly fastened
3	Screws and nuts screwed tightly, without missing flat washers and spring washers. Spring washers must be on the top of flat washers.
4	No cable damage.
5	Clean, no smudges or dust.
6	Connections between metallic parts must be reliable, to assure reliable electric connectivity.

Cable Inspection

Item	Description
1	The connection of the cable is tight, not loose or damaged.
2	The cable shell not damaged.
3	Grounding cable is connected properly.
4	Cables are dressed neatly, power kept separate from signal.
5	The minimum bending radius of the cable is proper. (Shouldn't be less than twenty times of the cable's diameter.)

2.11 System Test

Test the system after the device was installed and inspected.

Test steps:

mBSC power off

VSWR testing: sweep test of cables and antenna

mBSC power on

Signal testing: indoor signal level testing

Effect testing: CQT testing

Coverage Optimize: based on the signal & effect testing result, adjust the mBSC parameters to optimize the coverage

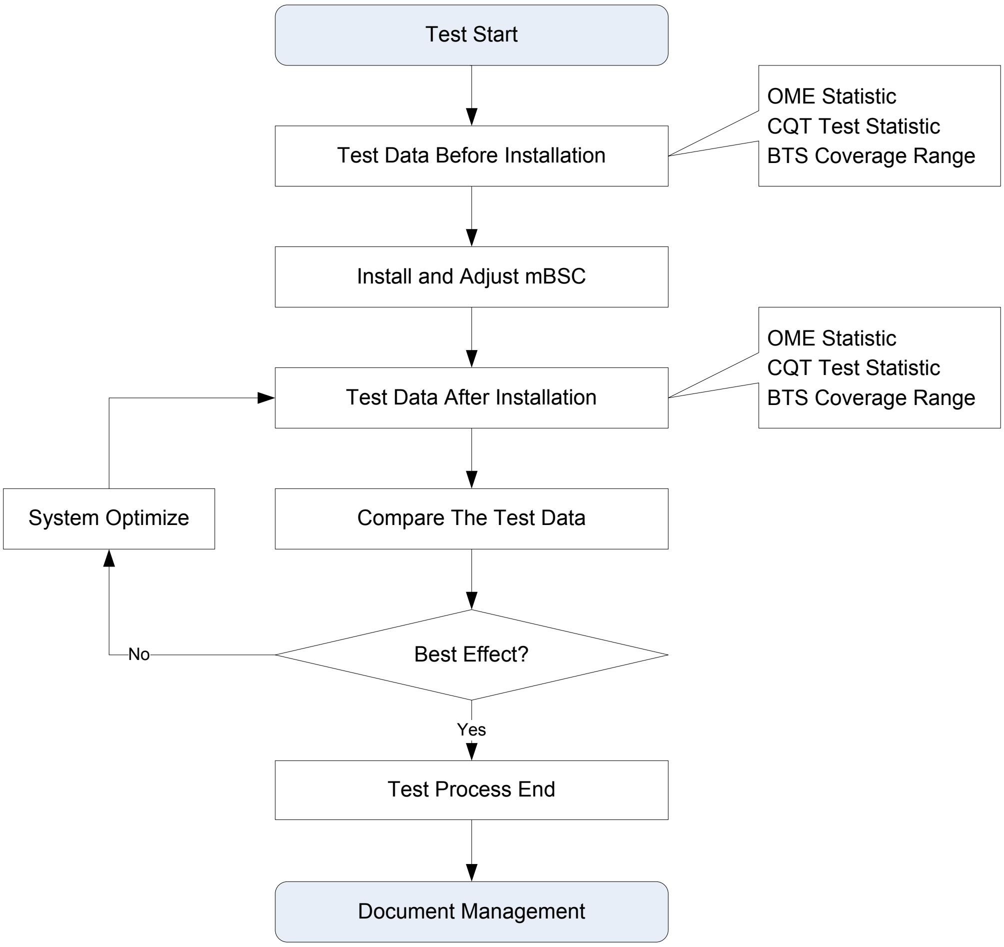


Figure 9 Flow Chart of System Debugging

3 System Monitoring & Configuration

There's a LCD & Key Panel inside the remote unit as the figure below.

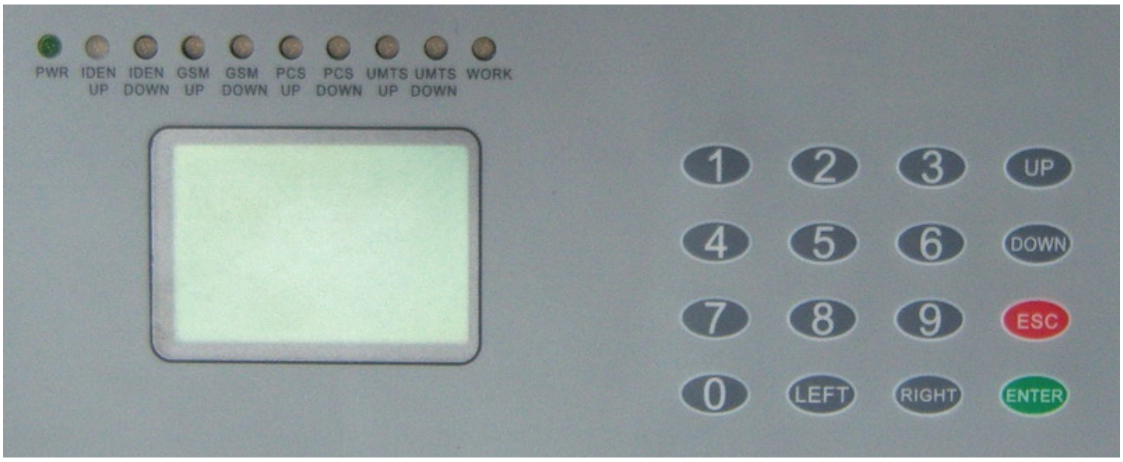


Figure 10 mBSC LCD & Key Panel

In the top of the panel, there're 10 LED indicators. The key pad is in the right. And the LCD displayer is in the left below the indicators.

3.1 Indicators Description

#	Indicator	Status	Description
1	PWR	Green	Power supply works normally
		Off	No power supply
2	IDEN UP	Green	IDEN uplink LNA works normally
		Red	IDEN uplink LNA alarm
3	IDEN DOWN	Green	IDEN downlink PA works normally
		Red	IDEN downlink PA alarm
2	GSM UP	Green	GSM900 uplink LNA works normally
		Red	GSM900 uplink LNA alarm
3	GSM DOWN	Green	GSM900 downlink PA works normally
		Red	GSM900 downlink PA alarm
4	PCS_UP	Green	GSM1800 uplink LNA works normally
		Red	GSM1800 uplink LNA alarm

5	PCS_DOWN	Green	GSM1800 downlink PA works normally
		Red	GSM1800 downlink PA alarm
6	UMTS_UP	Green	WCDMA uplink LNA works normally
		Red	WCDMA uplink LNA alarm
7	UMTS_DOWN	Green	WCDMA downlink PA works normally
		Red	WCDMA downlink PA alarm
8	WORK	Green(Flashing)	System works normally
		Red(Flashing)	System alarm

Notes: The indicators are customized according to the actual mobile systems.

3.2 System Monitoring & Configuration

The soft key pad contains 0~9 numbers and 6 function buttons. Following is the description for the operation.

#	Keys	Function Description
1	0~9	Parameter setting and functional item choosing
2	UP	Go to the previous page
3	DOWN	Go to the next page
4	DEL	Back to the main menu
5	ENTER	Confirm
6	LEFT	Go the left item
7	RIGHT	Go to the right item

3.2.1 Screen Menu

When the screen is in idle, the LCD will be off automatically. It will be on while any key is pressed and display the screen saver of “mBSC System”. Press any soft key again, it will display the main menu as below.

Menu Name	Description
PA STATUS	Power Amplifier working status

MS STATUS	System status
CONTROL	Power Amplifier's attenuation setting and restart

3.2.2 PA STATUS

There're 3 screens under 'PA STATUS' menu. Below is the menu description in detail.

Screen	Menu Item	Description
1	UP IDEN | UP GSM900 | UP PCS1800 | UP UMTS2100 | DW IDEN | DW GSM900 | DW PCS1800 | DW UMTS2100	Press soft key of '1-8' or 'LEFT, RIGHT' to choose address of PA
	Link: OK | ERR	Communicate connection is OK or Error
	RFfor: **.* dBm	Forward power
	RFin: **.* dBm	Input power
2	UP IDEN | UP GSM900 | UP PCS1800 | UP UMTS2100 | DW IDEN | DW GSM900 | DW PCS1800 | DW UMTS2100	Press soft key of '1-8' or 'LEFT, RIGHT' to choose address of PA
	VSWR: *.*	VSWR value
	Temp: **.* °C	PA temperature
	ATTE: **dB	Attenuator value
3	UP IDEN | UP GSM900 | UP PCS1800 | UP UMTS2100 | DW IDEN | DW GSM900 | DW PCS1800 | DW UMTS2100	Press soft key of '1-8' or 'LEFT, RIGHT' to choose address of PA
	ALC: **.* dB	Auto level Control value
	STATUS: RUN | STOP	PA status
	ALARM: NO|OV_TMP | OV_POW | OV_DRV | VSWR	PA alarm

PA alarm parameters Description:

PA Alarm Item	Parameters Description
NO	No alarm
OV_TMP	Over Temperature Alarm
OV_POW	Over Power Alarm
OV_DRV	Over Drive Alarm
VSWR	Over VSWR Alarm

3.2.3 MS STATUS (System Status)

There're 3 screens under 'MS STATUS' menu. Below is the menu description in detail.

Screen	Menu Item	Description
1	STATUS: OK | ALARM	System Operation status
	Temp: **.* °C	System temperature
	VOL: **.* V	System input voltage
	Door: Open | Close	Door status
2	FAN1 STA: ** OK | ERR	Fan1 rotating rate: circle/minute OK or Error
	FAN2 STA: ** OK | ERR	Fan2 rotating rate: circle/minute OK or Error
	FAN3 STA: ** OK | ERR	Fan3 rotating rate: circle/minute OK or Error
	FAN4 STA: ** OK | ERR	Fan4 rotating rate: circle/minute OK or Error
3	FAN5 STA: ** OK | ERR	Fan5 rotating rate: circle/minute OK or Error
	FAN6 STA: ** OK | ERR	Fan6 rotating rate: circle/minute OK or Error
	FAN7 STA: ** OK | ERR	Fan7 rotating rate: circle/minute OK or Error

3.2.4 CONTROL (Power Amplifier Attenuation Setting and Restart)

There's only 1 screen under 'CONTROL' menu. Below is the menu description in detail.

Screen	Menu Item	Description
1	UP IDEN | UP GSM900 | UP PCS1800 | UP UMTS2100 | DW IDEN | DW GSM900 | DW PCS1800 | DW UMTS2100	Press soft key of '1-8' or 'LEFT, RIGHT' to choose address of PA
	ATTE: ** dB	Power amplifier attenuation setting, ajustable range 0~30dB, 1dB step
	Run	Restart the power amplifier
	Return	Back to main menu

4 Terms, Acronyms & Abbreviations

Terms/Acronyms/Abbreviation	Definition
ANT	Antenna
AWG	American Wire Gauge
BTS	Base Transceiver Station or Base Transceiver System
C°	Degree Celsius
COM	Serial Communication Port
CQT	Call Quality Test
dB	Decibels
dBm	Power measurement referenced to the specific power level of one watt
DIN	Deutsches Insitut für Normung eV (German standards institution)
7-16 DIN	German standards RF connector: 7mm OD of inner contact, 16mm ID of outer contact.
DL	Downlink
EMC	Electromagnetic Compatibility
LNA	Low Noise Amplifier
MU	mBSC Master Unit
NMS	Network & Monitoring System
MCPA	Multi-carrier Power Amplifier
MHz	Megahertz
MTBF	Mean Time Between Failures
OMC-R	Operation Monitor Center - Radio

PA	Power Amplifier
RF	Radio Frequency
RU	mBSC Remote Unit
RX	Receive or Receiver
TMA	Tower Mounted Amplifier
TX	Transmit, Transmitter
VSWR	Voltage Standing Wave Ratio